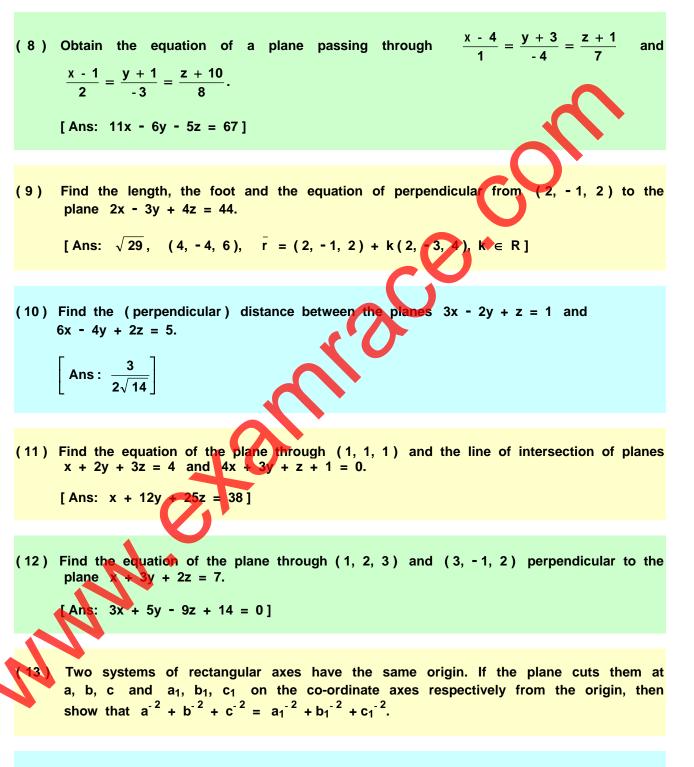
<u>09 - PLANE</u>

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- (1) Obtain the vector and Cartesian equations of the plane through A(1, 2, 3), B(2, 1, 0) and C(3, 3, -1). [Ans: $\bar{r} = (1, 2, 3) + m(1, -1, -3) + n(2, 1, -4), 7x - 2y + 3z = 12]$ (2) A plane intersects X-, Y- and Z-axes at A, B and C respectively. The centroid of triangle ABC is (p, q, r). Derive the equation of the plane. Ans: $\frac{x}{p} + \frac{y}{q} + \frac{z}{r} = 3$ (3) Obtain the foot of perpendicular from the point (1, 2, 3) on the plane x - 2y + 2z = 5 and the distance of the point from the plane. Ans: $\left(\frac{11}{9}, \frac{14}{9}, \frac{31}{9}\right), \frac{2}{3}$ (4) Find the image of (1, 3, 4) relative to the plane 2x - y + z + 3 = 0. [Ans: (-3, 5, 2)] (5) Find the common section of x + 2y - 3z = 6 and 2x - y + z = 7. $\frac{1}{1} = \frac{y-1}{7} = \frac{z}{5}$ Ans : 🍝 6) Obtain the equation of the plane through (1, 3, 5) perpendicular to the intersection of 3x + y - z = 0 and x + 2y + 3z = 5. [Ans: x - 2y + z = 0] (7) Obtain the equation of the plane containing r = (1, 1, 1) + m(2, 1, 2) k \in R and (1, -1, 2).

[Ans: 5x - 2y - 4z + 1 = 0]

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(14) Find the equations of the planes bisecting the angle between the planes x + 2y + 2z = 9 and 4x - 3y + 12z + 12 = 0.

[Ans: x + 35y - 10z - 153 = 0, 25x + 17y + 62z - 81 = 0]

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(15) Find the equations of the two planes through the points (0, 4, -3) and (6, -4, 3) other than the plane through the origin which cut off intercepts from the axes whose sum is zero.

[Ans: 2x - 3y - 6z = 6, 6x + 3y - 2z = 18]

(16) Find the equation of the plane passing through the line of intersection of the planes 2x + y + 3z - 4 = 0 and 4x - y + 5z - 7 = 0 and perpendicular to yz-plane.

[Ans: 3y + z = 1]

(17) A plane contains the points A (-4, 9, -9) and B (5, -9, 6) and is perpendicular to the line which joins B and C (4, -6, k). Evaluate k and find the equation of the plane.

[Ans: k = 10.2, 5x - 15y - 21z = 34]

(18) Prove that the equation of the plane which bisects the line joining (x_1, y_1, z_1) and (x_2, y_2, z_2) at right angles is

 $\sum (x_1 - x_2) \left(x - \frac{x_1 + x_2}{2} \right) = 0.$

(19) Find the equation of the plane passing through the line of intersection of the planes 3x + 3y + 2 = 23 and x + 3y + 6z = 35 which is at the shortest distance from the origin.

[Ans: 2x + 3y + 4z = 29]

(20)

 P_2 : x + 2y + 2z + 1 = 0 and P_2 : 2x + 2y + z + 2 = 0 are the equations of two planes having angle θ between them. Find the equation of the plane other than P_1 which makes the same angle θ with the plane P_2 .

[Ans: 23x + 14y - 2z + 23 = 0]

(21) A plane is drawn through the line x + y = 1, z = 0 to make an angle $\sin^{-1}(1/3)$ with the plane x + y + z = 0. Prove that two such planes can be drawn and find their equations. Also, prove that the angle between the planes is $\cos^{-1}(7/9)$.

[Ans: x + y - z = 1 and x + y - 5z = 1]